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1986 Employment Outlook

The transition from scientist to manager: It takes more than ability and hard work

Page 27

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OCTOBER 28, 1985

News of the Week

■ **First of five planned regional meetings kicks off discussions of Pimentel Report to brief chemical community on report's contents and catalyze support for it.** **Page 6**

■ **American Institute of Chemical Engineers issues book on procedures for evaluating hazards in chemical plants.** **Page 7**

■ **U.S. chemical companies report continuation of earnings decline in third quarter.** **Page 8**

■ **Sale of genetically engineered growth hormone for treating pituitary disorder approved by FDA.** **Page 9**

■ **Bristol-Myers agrees to purchase Genetic Systems for more than $240 million.** **Page 9**

Business

Biotechnology company Molecular Genetics finds selling products to farm market harder than expected. **Page 12**

Government

EPA's latest strategy for hazardous chemical air emissions control depends on state and local cooperation. **Page 16**

Binary chemical bomb still has technical problems, although the Defense Department has declared it ready for production. **Page 17**

Technology

Coal gasification plant that was part of ammonia-from-coal project will switch focus to production of fuel, other chemicals. **Page 21**

Completion of new science quadrangle at the University of Chicago marked by dedication of physics teaching center. **Page 22**

Awards

ACS award winners: Ruckenstein; Shakhashiri; Sinfelt; Stillinger; Viola; Weisz; Whetten, Grant, and Ezra; and Wolynes. **Page 54**

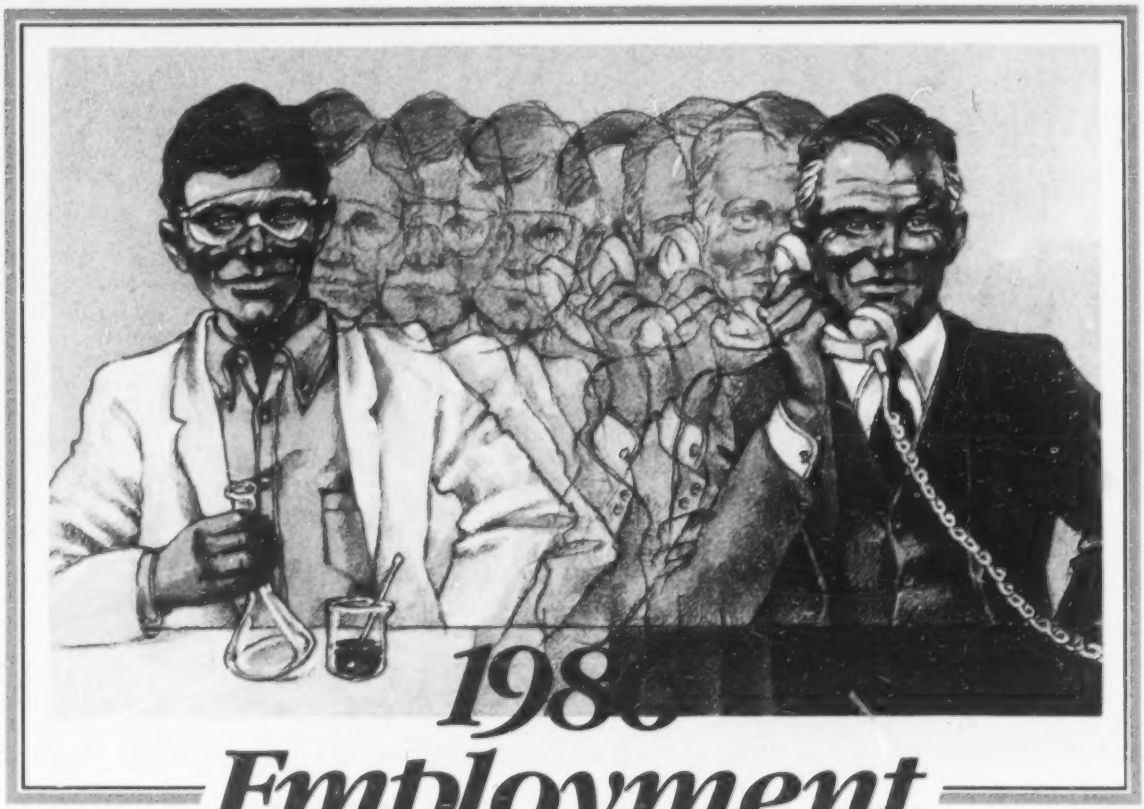
Letters 4
Editor's Page 5

Concentrates
Business 10
Government 15
Science/Technology 19

The Departments
New Products 51
ACS News 52
Newscripts 72

Employment Outlook

C&EN's annual look at the job picture gives some advice to scientists and engineers who are striving to move into management positions. **Page 27**



1986 Employment Outlook

Career Opportunities for Chemical Professionals

Despite predictions a year ago that demand for chemists and chemical engineers would rise in 1985, many employers actually are hiring fewer chemical professionals this year. The job market is being depressed as companies attempt to combat declining profits by cutting costs and running leaner operations. A rash of mergers in the past year or two also has restricted new hiring.

The overall result is a decidedly spotty look to the current employment picture. The situation certainly is improved from what it was two or three years ago, especially for chemical engineers, but it is still considerably weaker than it was during much of the 1970s.

On several university campuses, employers were recruiting this year's graduates a bit more briskly than was the case last year. On the other hand, employment advertising in C&EN this year is running slightly below last year's level, and employment activity at last month's ACS national meeting was slower than the year before.

Career Advancement

Scientists and engineers who want to become managers must carefully plan their strategy for reaching their goals. Good job performance alone, although important, is not enough. Page 28

Demand

The employment picture for chemists this year did not live up to expectations. Some observers also fear that the demand for such professionals will not improve significantly in 1986. Page 40

Salaries

Median salaries of chemists and chemical engineers grew this year. Between 1984 and 1985, they rose 6% for inexperienced B.S. chemists, 4% for their experienced counterparts. Page 45

Career Planning

The American Chemical Society and other organizations can furnish a variety of useful information to people seeking advice about careers in chemistry and chemical engineering. Page 47

Cuts in hiring by many employers dampen job prospects for chemists and chemical engineers

Demand

The job market for chemists and chemical engineers has been distinctly spotty this year. Although demand for chemical professionals clearly is stronger in 1985 than it was two or three years ago, the situation compared with last year is pretty much a standoff. On many university campuses, company recruiters were more active in the past 12 months, so that new graduates, expecially chemical engineers, have found it easier to land jobs than was the case in 1984. On the other hand, many major employers of chemists and chemical engineers have cut back their hiring appreciably.

In any event, demand for new chemists and chemical engineers did not expand this year as many college placement people and company recruiters had expected it would a year ago, when C&EN last took a look at the employment outlook for chemical professionals. As one university professor laments, "Although the employment situation this year is relatively good, it certainly isn't as excellent as it was 10 years ago."

Job prospects this past year for recently graduated chemists and engineers were similar to those for other recent graduates. As the College Placement Council puts it, "The 1984–85 college recruiting season began with optimistic projections. With the economy gaining momentum, the job outlook for new college graduates seemed excellent. But the year was full of surprises." The council adds that 1984–85 was "a good recruiting year, but one that fell short of expectations."

Other indicators of the job picture for chemical professionals are a similar mixed bag. The unemployment rate for chemists dropped to 1.4% last March, down from 1.7% a year earlier and 2.2% in March 1983, according to the American Chemical Society's annual survey of its members. Joblessness among chemical engineers also is down this year, according to the American Institute of Chemical Engineers. But help-wanted advertising in C&EN has been trending moderately downward from its peak levels of about a year ago. And recruiting activity at the Employment Clearing House during the ACS national meeting this past fall was less robust than at the national meeting a year earlier.

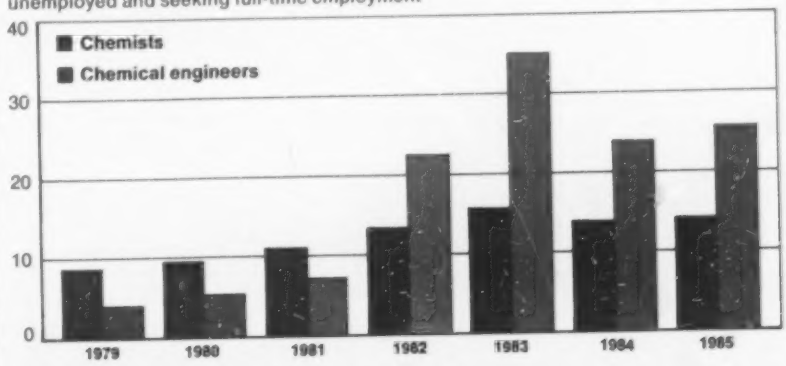
Mixed results are reported for recruiting at college chemistry departments. All chemistry Ph.D.s at Purdue University, for example, had jobs when they finished the 1984–85 academic year, as was the case for the previous academic year. In both years, too, new Ph.D.s typically had one or two job offers. On the other hand, in the late 1970s, chemistry Ph.D.s usually had four or five offers from which to choose.

Chemistry graduates this year, says Robert E. Wild, chairman of graduate admissions and placement-service liaison for Purdue's chemistry department, had to be more aggressive than usual in seeking jobs because of widespread economic uncertainty among employers. As a result, they had to have more job interviews both on and off campus.

Wild indicates that all Purdue's M.S. chemistry graduates in 1984–85 also had positions when they graduated this year. However,

Unemployment is down from 1983 for newly graduated chemists and chemical engineers, but continues high

Percentage of new bachelor's degree recipients who were unemployed and seeking full-time employment



Note: Data as of the summer of each year. **Source:** ACS starting salary surveys

only about 70 to 75% of the B.S. students who were looking for jobs had found them by graduation.

Audrey L. Aylesworth, chemistry placement coordinator at the University of Wisconsin, Madison, indicates that of the 35 Ph.D. candidates who interviewed for industrial positions in the 1984–85 school year, five reported no job offers as of mid-July. Industrial job offers averaged 2.6 per person (two students got six offers), compared with 3.1 offers in 1981–82, 1.5 in 1982–83, and 2.1 in 1983–84.

Twenty-four B.S. chemists graduating from the University of Wisconsin, Madison, in 1984–85 attempted to get industrial positions, but only seven were successful by the time they graduated. The average number of offers was 2.1 per person in 1984–85, compared with 2.3 in 1983–84. In the 1983–84 academic year, 11 of 23 B.S. graduates who were looking for industrial jobs succeeded in finding them.

At the University of Illinois, Urbana's school of chemical sciences, the number of employers who interviewed graduating students rose 11% in 1984–85, although the number of days they spent on campus decreased slightly. Rebecca J. Simon, the school's placement director, says that job offers received by graduating B.S. chemists in 1984–85 were 12% fewer than in 1983–84; job offers made to graduating Ph.D. chemists declined 24%.

Ph.D. chemistry graduates at the University of Minnesota in 1984–85 received on the average about two job offers, and by July only one student was without a position. Chemistry professor Paul G. Gassman also notes, "This past spring, several companies asked us to recommend B.S. people for employment, but by that time all of our B.S.s either had jobs or were going on to graduate school."

Chemistry graduates at Duke University this year likewise had relatively little difficulty finding jobs. Ph.D. graduates, says Charles H. Lochmüller, chairman of Duke's chemistry department, received from two to five offers. Of 50 B.S. or B.A. graduates in chemistry, 40 went on to graduate studies in chemistry or business administration or to medical or law school and those seeking chemical jobs got them "fairly readily," he says.

A similar report comes from the University of Oklahoma's chemistry department. Stanley C. Neely, assistant chairman of the department, says that all of its 1984–85 B.S., M.S., and Ph.D. graduates who were looking for an industrial or academic position had one at graduation time. He believes that graduates found it easier to get jobs in part because more companies outside the Southwest and not in the petroleum industry sent recruiters to the school in the past academic year.

Employment prospects for chemistry graduates of some schools have been affected adversely by depressed economic conditions locally. At the University of Houston, where many chemistry graduates in the past have taken jobs in the petroleum industry, chemistry students have faced tough sledding in finding jobs.

Mamie W. Moy, associate chairman of Houston's chemistry department, says that only about a fourth of its 1984–85 chemistry graduates (at all degree levels) had jobs in chemistry when they graduated. Since then, another 50% or so have obtained employment. Although the recent picture was far from rosy, it was better than in 1983–84, when the petroleum industry, Moy says, "hit rock bottom in hiring chemists and chemical engineers."

She points out that, in the mid-1970s, essentially all of the university's chemistry students had jobs when they left school. She also indicates that although she encourages students to look for employment where jobs would be more plentiful outside the Southwest, she finds that many of them, especially the B.S.s, are reluctant to move to other parts of the country.

For chemical engineering graduates, the recent job picture has not been good, but is getting better. It was very bad in 1982–83, when demand for engineers decreased sharply at a time when they were graduating in unprecedented numbers.

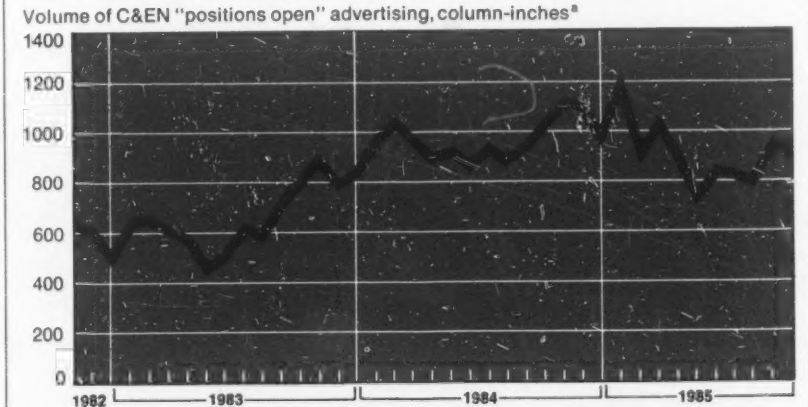
William L. Conger, head of the chemical engineering department of Virginia Polytechnic Institute & State University, says that about 70% of its B.S. chemical engineering graduates who were looking for jobs this year had them at graduation time, up from 50% in 1983–84 and only 30% in 1982–83. Ten years ago, practically all chemical engineering graduates had jobs when they left school.

Conger points out that about 25 B.S. chemical engineers in the class of 1985 were still searching for employment when they graduated. By September, only about 10 were without jobs.

The job market for new chemical engineers, he believes, likely will improve in the years immediately ahead. One reason is that the number of new graduates will decline,

Help-wanted ads have slipped from 1984 level

Volume of C&EN "positions open" advertising, column-inches[a]



[a] Column-inches published during consecutive periods of four weeks each; no issues were published in the last week of December 1982, 1983, and 1984.

Hiring of chemists slowed by business conditions

Job prospects for chemical professionals worsened this year and are expected to deteriorate still further next year, a C&EN survey of employers of chemists and chemical engineers indicates. Employers are hiring fewer chemical professionals in 1985 than they did in 1984. And the decline is expected to continue into 1986, although it is likely to be less marked then.

Business conditions get much of the blame. About a third of the organizations surveyed indicate that hiring has been greatly influenced by prevailing stagnant sales and low earnings. Another third say that current business has had at least a moderate impact on hiring.

As one company personnel official puts it, "The current economic picture has caused us to curtail or halt our plans to expand our research efforts, and this, in turn, has reduced our need for new chemists. We are mainly hiring to replace people who are promoted and have left the company." Another notes, "The significant decrease in our profits in the first quarter of 1985 has greatly reduced our technical recruiting."

The remaining third of the survey respondents claim, however, that economic factors have had little or no effect in the past 12 months on their hiring of chemists. One points out, "Our hiring for research is insulated, to a considerable extent, from economic fluctuations." This point is seconded by another company: "Our hiring reflects the status of our research efforts, which are more influenced by the strategic direction of our company than by the business climate."

Results from this year's survey are based on responses from 36 organizations, most of them chemical companies. A few responses came from research institutions.

These organizations employed about 18,900 chemists and 20,600 chemical engineers as of mid-1985, numbers that are essentially unchanged from 12 months earlier. Little further change is expected in these totals by mid-1986, moreover. Women account for 14% of

lessening competition for jobs. The size of the sophomore class in chemical engineering at Virginia Tech has dropped from about 90 in the fall of 1983 to 42 in the fall of 1985. This decrease reflects the belief of many students that chemical engineers have a tough time getting jobs, a perception far more true in 1983 than in 1985 and maybe not true at all in 1988.

The University of Illinois, Urbana, likewise reports that the job market for chemical engineering graduates is improving, with 8% more job offers made to graduating B.S. chemical engineers in 1984–85 than in 1983–84. Offers to Ph.D. chemical engineers increased 28%.

At State University of New York, Buffalo, the job market for new B.S. chemical engineers is still poor, although it is improving. Thomas W. Weber, chairman of SUNY Buffalo's chemical engineering department, says that 32% of new B.S. graduates had jobs when they left school this year, up from 21% for the class of 1984. The percentage of graduates who were still looking for jobs at graduation time rose slightly, however, whereas the percentage of those who planned to do graduate work fell from 21% to 5%.

"The job market was so bad for the class of 1984 that an unusually large number of our new B.S. graduates decided to do graduate work," Weber comments. "On the other hand, B.S.s in the class of 1985 appear to have been much more optimistic about their prospects of finding jobs after graduation."

The 59 B.S. chemical engineering students who graduated from the University of Washington in June 1985 had an easier time finding employment than did the 72 B.S. chemical engineers who graduated a year before. Charles A. Sleicher, chairman of the chemical engineering department, reports that 63% of 1985 graduates had jobs by September, compared with 50% of the June 1984 graduates. As for Washington's M.S. and Ph.D. chemical engineers, all who graduated in June 1985 had jobs when they left school.

Some university people emphasize that the 1984–85 job market for newly graduated chemists was not so good as had been anticipated a year ago, partly because the unexpectedly large decline in profits in the first half of this year led many employers to reduce hiring.

In the face of declining income and a desire to run a leaner operation, for example, Du Pont in academic year 1984–85 hired only about 50 chemists, primarily Ph.D.s. Du Pont had hired about 200 chemists in 1983–84. Du Pont emphasizes that it has reduced its hiring of all types of scientists and engineers—not merely chemists.

Donald L. Dinsel, manager of specialty staffing at Du Pont, stresses that, despite the company's cutback in the hiring of chemists and other professionals, Du Pont still has a strong commitment to research and development. "Hence, we have an obvious need for chemists," he says. "And just because we are making a heavy investment in the life sciences does not mean that we are abandoning other R&D areas."

Monsanto's hiring of chemists last spring was significantly less than had been predicted in the fall of 1984, says technical employment manager Dale B. Fox. This change resulted from a variety of factors, including the slowdown in the company's business in early 1985. In addition, Monsanto is installing a new $150 million research center for work on biotechnology and related fields—an effort that is requiring the increased hiring of molecular biologists, cell biologists, microbiologists, plant scientists, and others in the life sciences. Although biotechnology research also needs chemists, the company is tending to transfer into this area chemists now on its staff, rather than hire new ones.

Fox also points out that the company's need to employ new chemists has diminished as a result of its efforts in 1985 to de-emphasize its less profitable product lines. He adds that predicting how many chemists the company may require in the future has become more complicated because of its recent acquisition of G. D. Searle & Co.

Union Carbide's financial problems this year also have lessened its hiring of chemists. In August, the company announced that to reduce

the chemists and 9% of the chemical engineers, levels which also are not expected to change by mid-1986.

Although a year ago employers were saying that they intended to increase their hiring of chemists and chemical engineers moderately in 1985, now they expect that hiring will be down this year from 1984 close to 40% for chemists and nearly 30% for chemical engineers. And a further drop is seen next year—almost 20% for chemists and 15% for chemical engineers.

Slightly more than half the chemists hired this year and last were new graduates, but employers currently expect about two thirds of those offered jobs next year will be inexperienced. About three fourths of the chemical engineers expected to be hired this year and in 1986 will be new graduates, about the same as in 1984. Nevertheless, one employer points out that since "recent mergers in the chemical industry have led to an abundant supply of experienced, job-seeking chemical professionals, we now are more likely to recruit these people than new graduates."

Employers indicate that they made 6% more visits to college campuses to recruit both chemists and chemical engineers during the 1984–85 academic year than they had the year before. During the current academic year, however, they plan to cut back such recruiting about 10% or so.

Most organizations add that they are looking for chemists with specialized skills this year, with the most frequently mentioned specialists being (in decreasing order) organic chemists, analytical chemists, polymer chemists, physical chemists, and biochemists.

Despite their current reduced interest in hiring, 80% of the respondents think that the employment outlook for chemists in their organizations will range from good to very good for chemists during the next five years; for chemical engineers, more than 70% think the outlook is good or better. Although no one indicates that job prospects will be poor for chemical professionals, no one describes them as excellent, either.

costs, it would decrease its salaried staff by 4000 by early next year. This 15% reduction will be brought about mainly by offering employees incentives to take early retirement.

To date, Carbide has given no indication of how many of these 4000 people will be chemists, although a significant number are expected to be. Carbide's plans to shut down some chemical plants and sell others also will diminish the size of its chemical staff.

Another company whose financial difficulties have reduced its demand for chemists is Hoffmann-LaRoche. In February, the company stated that it had dismissed about 1000 employees nationwide, most of whom were in New Jersey, where the firm has its headquarters and most of its research facilities. (According to some noncompany reports, the figure was at least 1400 employees.) Hoffmann-LaRoche declines to indicate how many of those terminated were chemical professionals. However, the ACS Committee on Professional Relations has indicated that at least 122 were chemists or chemical engineers.

Other companies have forced significant numbers of experienced chemists and chemical engineers onto the job market and thus increased competition for employment. For example, Chevron Corp.'s takeover of Gulf Corp. early this year led to the dismissal of a large number of Gulf's chemical professionals. Chevron abolished thousands of jobs of all types at Gulf to increase "efficiency through the elimination of overlap."

Exxon Research & Engineering Co., which employs most of Exxon Corp.'s scientists and engineers, says that, because of marked declines in the corporation's profits in recent years, it has found itself with a considerable surplus of employees. As a result, Exxon Research has not had an active campus recruiting program for scientists or engineers, for the past three years. However, within the past month or so, it has instituted a small on-campus recruiting program. "A healthy proportion of the new people we will be looking for," says an Exxon spokesman, "will be chemists and chemical engineers."

Not all chemical companies have cut back on hiring chemists, however. In the past two years, Rohm & Haas has hired about 100 Ph.D. chemists and other scientists. Normally, it would have hired only about 50 Ph.D. scientists in a two-year period. The main cause of this growth, says placement supervisor James D. Burke, has been expanding research on pesticides and specialty polymers.

Procter & Gamble reports that it hired more Ph.D. chemists and life scientists in 1985 than in any other year in its history. Ted J. Logan, manager of the company's Ph.D. recruiting, says, "Our growing research and development efforts, especially in the health-care and pharmaceutical areas, has increased our demand for life scientists but has not reduced our need for chemists."

Many university placement people expect job prospects for next year's chemical graduates to be about the same as they were for the class of 1985. But several observers emphasize the great difficulty in predicting the economy early next year—a factor that could greatly influence demand for graduates.

Simon of the University of Illinois expects that demand for chemistry graduates in 1985–86 will be "about the same as it was last year." She notes, "We have about the same number of employers scheduled now as we did last year at this time."

Fox of Monsanto believes that the demand for chemists in 1986 will be no stronger than in 1985 because of the decline in the profitability of commodity chemicals. Logan of Procter & Gamble expects demand for Ph.D. chemists in 1986 to be down about 20% from this year because of disappointing profits and sizable acquisitions by some major companies. Acquisitions often result in overlapping functions in the new company, leading to lost jobs and lower recruiting.

Burke of Rohm & Haas believes that companies will be placing more stress than ever on efficiency and reducing overstaffing. This trend will probably reduce the demand for chemists and chemical engineers. Burke says, "Our company's

goals for professional recruiting this coming year will be rather modest."

The prevailing view, however, is that graduating B.S. chemical engineers will find it easier to get industrial jobs in 1986 than did their counterparts in 1985, in part because fewer will be graduating.

Julian C. Smith, professor of chemical engineering at Cornell University, notes that the marked shrinkage in job openings for chemical engineering graduates in 1982 and 1983, with the resulting sharp dropoff in chemical engineering enrollments, has reduced the size of Cornell's graduating classes for 1986 and 1987. "In the next two years," he says, "we expect to grant no more than 30 to 35 B.S. degrees in chemical engineering, compared to almost 60 in 1985."

Conger of Virginia Tech expects that at least 80% of its B.S. chemical engineers in the class of 1986 will have jobs when they graduate, compared to 70% for the previous graduating class. He also says that several company recruiters already have indicated that they plan to hire more chemical engineers next year.

The College Placement Council reports that the new B.S. chemistry graduates received 12% fewer job offers as of July 1985 than as of July 1984. New Ph.D. chemistry graduates got 24% fewer offers. On the other hand, new B.S. chemical engineers received 8% more offers and Ph.D.s got 28% more.

The 169 reported offers made to B.S. chemists as of July 1985 were considerably fewer than the number of offers to B.S. computer scientists (3796), mathematicians (565), or health professionals (288).

The council also indicates that as of July 1985, male B.S. chemists received 34% fewer offers than they did in the 12 months ending July 1984. Women B.S. chemists, on the other hand, got 25% more offers. Male B.S. chemical engineers received 14% more offers, but women B.S. chemical engineers got 3% fewer offers.

Despite gloomy reports from some employers about their recently decreased demand for chemical professionals, the 1.4% overall unemployment rate among ACS-member chemists on March 1, 1985, is lower than in any year during the past 15 except for the three-year period from 1979 to 1981. The latest annual ACS survey shows that the unemployment rate on March 1, 1985, was 2.0% for chemists with B.S. degrees, 1.6% for those with M.S. degrees, and 1.1% for Ph.D.s.

The American Institute of Chemical Engineers also finds that the overall unemployment rate among its members has declined in the past few years, to 2.8% last February. The rate was 4.3% in February 1983 and 3.2% in February 1984. The 4.3% figure for 1983 was the highest since the institute began surveying its members in 1971. Although pleased with the 1985 finding, AIChE says, "We had expected a greater decrease. It now seems that it may take a longer period of time to reach the heydays when the rate of unemployment was a low 1% or less."

The Employment Clearing House at the ACS national meeting in Philadelphia in August 1984 was described as "extremely busy," with the mood of both employers and job applicants "decidely upbeat." At the most recent ACS clearinghouse during the national meeting in Chicago this past September, however, activity was down and the prevailing mood was less bullish.

Employer representatives totaled 240 at the Chicago clearinghouse, compared with 290 in Philadelphia. Job applicants dropped to 776, compared with 842 in Philadelphia, and the number of positions listed for candidates' review was 350 (vs. 446). The total number of job interviews was 1770 (vs. 2428), and the average number of interviews per candidate came to 2.3 (vs. 2.9). Employer representatives in Chicago, says one observer, were not only less active in seeking new people but were unusually specific about the types of positions they were attempting to fill. The types of chemical professionals that employers were looking for at the Chicago clearinghouse were primarily (in decreasing order) analytical chemists, organic chemists, polymer chemists, chemical engineers, and biochemists.

The volume of "position open" advertising in C&EN this year similarly indicates that demand for chemical professionals has been weakening. The number of column-inches of such advertising in the first 40 issues of 1985 was 9125, 4% less than in the first 40 issues of 1984. Actually, though, the 1984 level was unusually high, 53% greater than the amount of such C&EN advertising published in the first 40 issues of 1983.

Overall demand for scientists and engineers is reflected in the high-technology index published by Deutsch, Shea & Evans, a recruitment advertising agency, which bases its index on the volume of recruitment advertising directed to scientists and engineers. The index fell from 135 in July 1984 to 125 in December 1984. After rising slightly to 127 in February 1985, it has dropped since then to 105 last July. Even though the July figure was a two-year low, DS&E believes that further declines are likely. □

Chemistry grads increase at M.S. and Ph.D. levels; chem engineering grads higher at all levels

Academic year	Degrees awarded in chemistry[a]			Degrees awarded in chemical engineering		
	Bachelors	Masters	Ph.D.s	Bachelors	Masters	Ph.D.s
1973–74	10,525	2138	1828	3454	1045	400
1974–75	10,649	2006	1824	3142	990	346
1975–76	11,107	1796	1623	3203	1031	308
1976–77	11,322	1775	1571	3581	1086	291
1977–78	11,474	1892	1525	4615	1237	259
1978–79	11,643	1765	1518	5655	1149	304
1979–80	11,446	1733	1551	6383	1271	284
1980–81	11,347	1654	1622	6527	1267	300
1981–82	11,062	1751	1722	6740	1285	311
1982–83	10,796	1622	1746	7185	1368	319
1983–84[b]	10,700	1670	1780	7300	1425	330

a Data do not include biochemistry and geochemistry. b C&EN estimates. **Source:** Department of Education's National Center for Education Statistics